

Issued September 28, 1912.

U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF SOILS—MILTON WHITNEY, Chief.

IN COOPERATION WITH THE UNIVERSITY OF MISSOURI AGRICULTURAL
EXPERIMENT STATION, F. B. MUMFORD, DIRECTOR.

SOIL SURVEY OF PLATTE COUNTY,
MISSOURI.

BY

A. T. SWEET, OF THE U. S. DEPARTMENT OF AGRICULTURE, AND
J. E. DUNN AND E. S. VANATTA, OF THE
UNIVERSITY OF MISSOURI.

J. E. LAPHAM, INSPECTOR IN CHARGE OF NORTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1911.]



WASHINGTON:
GOVERNMENT PRINTING OFFICE,
1912.

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LETTER OF TRANSMITTAL

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., March 21, 1912.

SIR: In the extension of soil-survey work in the State of Missouri, work was undertaken in Platte County, the selection of this area being made after conference with State officials, with whom the bureau is cooperating.

I have the honor to transmit herewith the manuscript report and map covering this work and to request their publication as advance sheets of Field Operations of the Bureau of Soils for 1911, as authorized by law.

Very respectfully,

MILTON WHITNEY,
Chief of Bureau.

HON. JAMES WILSON,
Secretary of Agriculture.

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MAP.

Soil map, Platte County sheet, Missouri.

SOIL SURVEY OF PLATTE COUNTY, MISSOURI.

By A. T. SWEET, of the United States Department of Agriculture, and J. E. DUNN and E. S. VANATTA, of the University of Missouri.

DESCRIPTION OF THE AREA.

Platte County lies in the northwestern part of Missouri. Its extreme length from north to south and width from east to west are about equal, approximately 26 miles. It is bounded on the north by Buchanan County, on the east by Clinton and Clay Counties, and on the south and west by the Missouri River, along which it has a frontage of about 50 miles. The included area is 427 square miles, or 273,280 acres.

Topographically the county may be divided into two distinct types of country, the flat, almost level flood plains of the Missouri and

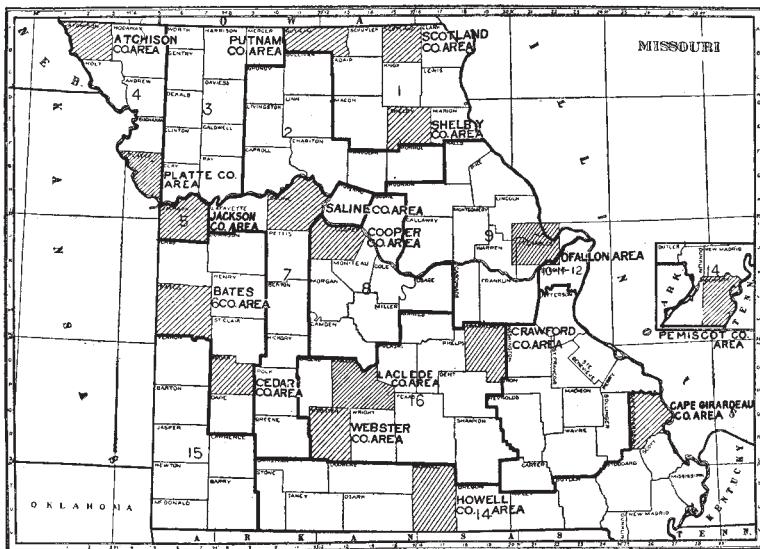


FIG. 1.—Sketch map showing the areas surveyed in Missouri.

Platte Rivers and some smaller streams, and the thoroughly dissected uplands.

The elevation of the Missouri River flood plain in the southern part of the county is approximately 760 feet above sea level and in the northern part slightly higher. The elevation of the Platte River flood plain and that along the lower course of some of the smaller streams is somewhat greater than that of the Missouri.

These flood plains, or bottom lands, except where broken by low terraces, lakes, and sloughs, are smooth. They are bordered by steep

bluffs, the most pronounced of these occurring along the Missouri River.

The bottoms along the Missouri River vary in width from $1\frac{1}{2}$ miles in the southern part of the county to slightly more than 3 miles in the northern part. Those along the Platte River vary in width from one-half to over three-fourths of a mile.

The upland is a thoroughly dissected plain, which once sloped very gently from northwest to southeast. Numerous streams have cut back into this plain, so that the only remnants of the upland are the narrow ridges which separate the small drainage systems. The highest of these ridges, located about 1 mile east of Iatan, has an extreme elevation of slightly more than 1,100 feet, and the divides in many parts of the county have an elevation of more than 1,000 feet above sea level. The most extensive of these ridges occurs in the southern part of the county and extends northeast from Hampton, passing out of the county a short distance north of Barry. It forms the watershed between Smith Fork and Platte River on the north and the small streams which flow into the Missouri River on the south. Another high divide separates the drainage of Bee Creek from that of the Platte River, while a third separates the drainage of Bee Creek from that of the small streams which flow into the Missouri River on the west. The topography of the higher parts of these divides is gently undulating, but becomes steeper and more broken as the main streams are approached. Bordering the valley of the Platte, Smith Fork, Bee Creek, and some of their larger tributaries, the slopes are steep and sharp and rock outcrops and low ledges are of frequent occurrence.

The unevenness of the surface also increases as the bluff line bordering the Missouri River flood plain is approached. This bluff line frequently rises from an elevation of 760 to over 1,000 feet in a distance of from one-fourth to one-half mile. A low rock ledge occurs in most places along this bluff line, but the surface for a distance of several miles back from the bluff is so thoroughly dissected that it presents a succession of steep hills and intervening hollows. The topography of Platte County, however, is not of that sharp type found where erosion forms have not been modified by subsequent deposition, but has instead a rounded, billowy appearance, such as uneven surfaces have when covered by a heavy snowfall. This is due to the covering of many irregularities, steep slopes, and deep cuts by a heavy deposit of wind-blown material known as loess. This is deepest and has had the most influence on the topography along the river bluffs, but the topography of all parts of the county have been influenced to a greater or less extent by it.

The drainage of the central part of Platte County is into the Platte River, which enters the county near its northeastern corner and, after following a meandering course to the southwest, enters the Missouri Valley near Farley. It formerly maintained a different

course through the Missouri flood plain, entering the Missouri River near Parkville. Later its course changed and it entered the river near Waldron, and recently it has again changed and now enters the Missouri $1\frac{1}{2}$ miles south of Farley. The largest tributary of the Platte River is Smith Fork, which, with its tributaries, drains a considerable area in the east-central part of the county, and enters the Platte about $2\frac{1}{2}$ miles northwest of Hoover. Bee Creek drains a considerable area in the north-central part of the county, while Mission Creek, Bear Creek, Pedee Creek, Brush Creek, and several smaller streams drain areas along the southwest side directly into the Missouri River. The channel of the Missouri River is constantly changing its position and has frequently made cut-offs since its channel was established as the State boundary line, so that this line is now in several places some distance from the river channel, thus leaving portions of Missouri on the west side of the river and portions of Kansas on the east side. In this connection it is proper to state that Sigers Island, lying northwest of Waldron, has been inadvertently omitted from this survey.

The territory included in Platte County, prior to that time part of an Indian reservation, was opened for settlement in February, 1837. The county was organized in December, 1837, and was within a few years, next to St. Louis County, the most populous in the State.

The settlers of Platte County came immediately from Clay and other near-by counties, but originally principally from Kentucky, Tennessee, and Virginia. There has been little change in the character of the population in the county since it was first settled, until within the last few years, the descendants of the early settlers forming a very large proportion of the inhabitants. Since the revival of the tobacco industry, however, a good many tobacco growers have been induced to settle in the county. These have come principally from Kentucky.

The first year after the county was settled it had a population of 20 to the square mile. In 1910, 73 years later, it had a population of only 14,429, or approximately 35 to the square mile.

Platte County has no large towns, the largest being Weston, Platte City, Parkville, Dearborn, Edgerton, and Camden Point, each having between 500 and 1,000 population. Other smaller towns are Waldron, Farley, Iatan, Linkville, Tracy, Ridgeley, and New Market. Platte City is the county seat; Parkville is the site of Park College, an important educational institution of the State. At Weston is located a brewery and a distillery. It is also the center of an important tobacco industry. Although there are no towns of the first rank within the county, good markets and trading points are quite accessible, Kansas City being just outside of the county to the south, St. Joseph 15 miles from its northern boundary, and Leavenworth and Atchison, Kans., across the Missouri River on the west.

Platte County is fairly well supplied with transportation facilities. The Chicago, Burlington & Quincy Railroad follows the Missouri River Valley along the western edge of the county. The Chicago Great Western crosses the Missouri River at Leavenworth and passes out of the county north of Dearborn. A branch line of the Chicago, Rock Island & Pacific extends from Beverly Station to the northeast, passing out of the county near its northeast corner, while another branch of the same system extends from Edgerton Junction through Dearborn and northwest to Atchison. An electric line from Kansas City to St. Joseph is now under process of construction. This will extend from near the southeast corner of the county slightly west of north, passing out of the county near Dearborn.

There are no macadamized or gravel roads in the county, and the dirt roads over much of it are in poor condition.

CLIMATE.

No suitable records of the weather conditions have been kept within the county. The following table gives the records for Kansas City, a short distance outside of the county:

Normal monthly, seasonal, and annual temperature and precipitation at Kansas City.

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.	Snow, average depth.
	° F.	° F.	° F.	Inches.	Inches.	Inches.	Inches.
December.....	34	70	-13	1.4	1.7	1.4	4.7
January.....	30	69	-17	1.3	0.4	4.1	5.6
February.....	29	76	-22	1.8	1.4	1.1	8.0
Winter.....	31			4.5	3.5	6.6	18.3
March.....	41	88	2	2.5	3.7	4.5	4.1
April.....	56	90	22	3.0	4.2	3.8	1.0
May.....	65	90	36	5.1	0.8	7.7	0.0
Spring.....	54			10.6	8.7	16.0	5.1
June.....	74	100	48	4.4	2.5	6.0	0.0
July.....	78	106	54	5.0	2.8	4.9	0.0
August.....	76	103	46	4.0	2.6	5.0	0.0
Summer.....	76			13.4	7.9	15.9	0.0
September.....	69	101	35	3.9	1.8	4.5	0.0
October.....	58	91	26	2.3	2.2	4.4	0.4
November.....	43	79	4	1.7	0.6	2.7	1.3
Fall.....	57			7.9	4.6	11.6	1.7
Year.....	54	106	-22	36.4	24.7	50.1	25.1

There is an average annual rainfall of 36.4 inches. The precipitation is fairly well distributed throughout the year, but is greatest during the months from April to October, the period when it is most needed. The soils over a great part of the county retain moisture well. The crops in this region do not suffer so seriously from drought as do those of the level prairies in the central part of the State.

The average growing season—that is, the period between the latest killing frost in the spring and the first killing frost in the fall—is 181 days.

AGRICULTURE.

Platte County is well suited in both soils and climate to a wide range of crops. Any grain, forage plant, fruit, or vegetable suited to the climatic conditions of the Middle West can be grown successfully here. At one time it produced more hemp than any other equal area in the country,¹ but this crop was abandoned long ago. In the production of tobacco only one other county in the State exceeds it, and that by only a very small amount. In the manufacture of whisky it is the leading county, the output for the year 1909 being 270,762 gallons, valued at \$609,215.

Few other counties in the State have such a large percentage of first-class farming land or have local markets so accessible. Kansas City and St. Joseph, Mo., Leavenworth and Atchison, Kans., are each so short a distance from the county boundaries that farm and garden products can readily be hauled to their markets by wagon. In addition to this several lines of railroad offer good transportation facilities to these markets and to those of Chicago and St. Louis.

Under conditions of this kind it seems remarkable that more intensive and more profitable farming has not taken the place of wheat and corn raising to a greater extent than it has. For the last five years tobacco has been grown on a considerable acreage, but with this exception practically no crop requiring intensive farming is produced in the county.

A comparison of the value of the agricultural products of Platte County with those of a near-by county having no better market facilities and probably a lower percentage of first-class farming land shows in a striking manner the difference in results obtained in the two counties. The figures show that in this county the value of the live stock per acre is one-third more than in Platte, the farmyard products, poultry, eggs, etc., two and one-half times as much, the vegetables sixteen times as much, fruit nearly twice as much, and dairy products nearly three and one-half times as much. Only in general farm crops does Platte County surpass it to a small extent, this being due to the large production of wheat and tobacco. Com-

¹ Census, 1860.

paring the returns from all of these products, it is found that for every \$100 worth of products grown on the farm in Platte County a little more than \$170 is produced on the same area in this more intensively farmed county.¹

According to the Bureau of Labor Statistics, the production of the principal farm crops for the year 1909 in Platte County was as follows:

Estimated production of wheat, corn, oats, and forage for 1909.

Crop.	Area planted.	Average yield per acre.	Total yield of county.
	<i>Acres.</i>	<i>Bushels.</i>	<i>Bushels.</i>
Wheat.....	37,658	20	753,160
Corn.....	51,383	33	1,695,639
Oats.....	2,268	30	71,040
Hay and forage.....	14,250	122,800

¹ Tons.

This table is somewhat striking in two respects. It shows a relatively large acreage of wheat as compared with corn, the acreage of the former being practically three-fourths that of corn, while in the State as a whole it is only about three-tenths as large. It also shows a high average yield of wheat per acre, the yield for the State as a whole for the year 1909 being 15.3 bushels, while for a period of eight years it has averaged only 13.7 bushels. The estimated average yield of Platte County for the year 1909 was 20 bushels and the yield for 1911 was probably in excess of this amount.

The principal varieties of wheat grown are Red Chaff, Harvest King, Harvest Queen, May, and Fultz. No commercial fertilizer is used, and in many cases wheat is sown on the same ground several years in succession. A continuation of such practices will undoubtedly in time lead to deteriorated soils and decreased yields. Good yields are now obtained, a yield of from 25 to 40 bushels per acre being not uncommon. Clover sown in the wheat in the spring, on account of difficulty in obtaining a stand, is used to a less extent than formerly. By a more general use of clover and cowpeas, by exercising more care in the preparation of the seed bed, by treating the seed for the eradication of smut, and by giving wheat a place in a well-arranged crop rotation, the yield can be increased and the productiveness of the soil maintained.

Corn is grown throughout the county, and the yields on the whole are good, but much less attention is being given to the improvement of corn here than in many other counties of the State. Little atten-

¹ Surplus Products of Missouri Counties, 1910.

tion is given to varieties or to the selection of the seed, and careless methods are often used in planting and in cultivation.

About half the corn in the county is check-rowed, while the remainder is listed, some communities using one method almost exclusively, and vice versa. The results obtained, if taken for a long period of years, would probably be about the same, the former method proving better in some seasons and the latter in others.

More attention should be given to thorough preparation of the seed bed, to obtaining a uniform stand, to the planting of well-selected varieties, instead of mixed seed, as at present, and to thorough cultivation. Not more than two crops of corn should be planted in succession on the same land, and where the soil is thin only one crop should be grown. Corn should follow clover, cowpeas, or pasture, or should be used on land to which an application of manure has been made.¹

The average yield of corn in Platte County, as given by the Bureau of Labor Statistics, is 33 bushels per acre. By intelligent, skillful farming this yield can undoubtedly be increased to 50 bushels or more.

Oats, on account of rust, have not been a very satisfactory crop for several years past, the yields being small and uncertain. By the introduction of rust-resistant varieties, of which the Texas Red seems to be the most satisfactory, somewhat better results are being obtained.

Alfalfa growing is receiving considerable attention in parts of the county, but has hardly passed beyond the experimental stage, the fields being small, usually only a few acres. Alfalfa can be grown on any deep, well-drained productive soil which will produce good clover, if the soil is free from weed and grass seed before the crop is sown and if the proper precautions are taken to obtain a good stand. The bottom-land soils best suited to this crop, however, are the silt loams and fine sandy loams, when the latter are not too light in texture, and the Knox silt loam and the brown phase of the Marshall silt loam of the loess upland soils. Three and sometimes four cuttings of alfalfa, yielding from one-half to over one ton at a cutting, are obtained. It is not believed that alfalfa should take the place of clover in a region so well suited to the latter crop, but on account of the large amount of feed which it produces and its ability to withstand drought no farm should be without a small field of alfalfa.²

¹ Farmers' Bulletin No. 318, U. S. Dept. of Agr., Circular No. 39, The Seeding of Cowpeas, Missouri Experiment Station, and Growing Cowpeas in Missouri, issued by the State Board of Agriculture, give valuable suggestions on growing this crop.

² See Farmers' Bulletin No. 339, U. S. Dept. of Agriculture, and Circular No. 40 and Bulletin No. 72, issued by the Experiment Station, Columbia, Mo.

Next to the production of corn and wheat the growing of tobacco is the most important industry of the county. Tobacco has been grown in a small way for home use ever since the county has been settled, but no tobacco had been grown for the market for several years until about five years ago. The growing of White Burley tobacco was then introduced, and the results obtained have been so satisfactory that the business has increased until at present Platte is surpassed by only one other county in the State in the production of tobacco.

The following table shows the remarkable increase in this crop:

Production of tobacco in Platte County for the years 1907 to 1910, and average price.

Years.	Production.	Price per pound.
	<i>Pounds.</i>	<i>Cents.</i>
1907.....	260,000	11 to 12
1908.....	472,000	16
1909.....	2,200,000	13
1910.....	3,000,000	8

The leading soils for tobacco are the Knox silt loam and the brown phase of the Marshall silt loam. Of these the Knox silt loam, or yellowish-brown soil of the hills, is the better, giving not only a larger yield, but also a better quality of leaf. The Crawford stony clay loam is also used to a limited extent, but unless it has a surface covering of loess it is not a very satisfactory type for tobacco culture.

In favorable seasons the yield of tobacco is approximately 1,800 pounds per acre. The quality is good. When sold on the Louisville market in competition with Kentucky-grown tobacco it commands equally high prices.

Much of the tobacco in Platte County is grown by tobacco raisers who have been brought in from Kentucky for the purpose. Some of it, however, is grown by the owners of the land. Where grown by tenants the landlord furnishes land, barns, and farming outfit and receives one-half the tobacco.

The growing of tobacco in Platte County has led to the clearing of many small timbered areas which had been left for many years for wood and pasture, and on account of the steepness of the slopes. Newly cleared land is considered the best for tobacco, but it has been found that on old land a crop of cowpeas plowed under will do much to restore the soil to a productive condition.

Only a few fields of cowpeas were seen in the county during the progress of the survey. This may be made a very valuable crop, both on account of the feed which it will yield and also on account of its

beneficial effect on the soil. Cowpeas may follow a crop of wheat or oats as soon as the grain is cut and may be used for hay or pasture or may be planted in the corn at the last cultivation.

Much of the soil of Platte County is well suited for the growing of garden vegetables, melons, small fruits, and berries, yet the growing of such crops for market is receiving very little attention. Much of the best gardening land is accessible to the Missouri and Platte Rivers, and it would seem that important interests of this kind might be developed, motor boats being used for carrying the products to market.

Dairying is another industry for which this country is admirably suited and which is receiving almost no attention. With its wide range of forage crops, clover, and alfalfa and large yields of corn for ensilage combined with accessible markets few regions are so favorably situated for a profitable dairy business. Stock raising of all kinds should receive much more attention than at present.

Systematic crop rotations should be adopted, in which the use of land for pasturage, the growing of legume crops and the use of manures should have a regular place.

When such a system of farming is adopted and is supplemented by dairying, by tobacco growing, and by market gardening and fruit raising, the agricultural output of the county will be very greatly increased.

Artificial drainage by means of open ditches or tile might be resorted to with good results in many sections of the bottom lands throughout the area.

Soil moisture could be conserved and loss in times of drought reduced to a minimum by a system of deep plowing, harrowing, and disking the soil thoroughly and forming a dust mulch. With an annual rainfall of 35 inches crops need never suffer from drought when proper measures are adopted to preserve soil moisture.

Erosion constitutes the most serious source of damage to the soil in the county. Deep plowing and the incorporation of organic matter, thereby increasing the moisture-absorbing capacity of the soil and preventing rapid run-off of storm waters will do much to check this. Contour farming along slopes and the planting of sod crops to hold the soil together and prevent washing will also do much to prevent serious damage. Redtop is an excellent grass for this purpose, as it forms a strong sod.

SOILS.

The soils of Platte County may be separated according to origin into three broad divisions—the residual soils, the glacial and loessial soils, and the alluvial soils. In extent of area covered and in

their value for agriculture the glacial and loessial soils are of first importance, the alluvial soils are next, and the residual soils of smallest extent and also of least value.

Underlying the surface covering of soil throughout this part of Missouri are alternating beds of limestone and shale and in places thin beds of sandstone. These beds belong to the Upper Coal Measures and dip slightly to the north and west, so that the older or lower beds come near the surface in the southern part of the county, while the higher or more recently formed beds are near the surface in the northern part. Owing to the surface covering of soil these rock beds can be seen only along the steep bluffs bordering the stream valleys and where small streams have cut their way back into them. The slight dip or tilt of the beds can be readily seen along the railroad between Beverly Station and Weston or on the Kansas side of the river between Fort Leavenworth and the terminal bridge.

Wherever rock outcrops occur the limestone, and, in parts of the county, sandstone, beds are the most prominent, ledges varying in thickness from a few to as much as 20 feet or more being quite common. Above and below these ledges and in many places where no ledges occur fragments of limestone almost cover the surface of the ground. This prominence of the limestone at the surface is not due to its greater thickness, but to its greater hardness, which enables it to withstand weathering more effectively than the other rocks. The shale beds are much softer and soon break down, forming a surface covering of soil. The shale beds are rarely seen, except when they have been cut into in grading roads, along recently cut stream channels, or where well protected by an overlying bed of limestone. Along the upper course of Jordan Branch in the north-central part of the county shale outcrops over 20 feet in thickness were seen and along the road half a mile east of Platte City beds of more than twice that thickness are exposed. Judging from the position of the outcropping limestone beds, however, the shale beds are in places from 40 to 80 feet or more in thickness. In parts of the county where the glacial and loessial covering is thin and hard limestone beds come near the surface they have checked the widening of the stream valleys, which in these places consist of a narrow flood plain bordered by a long, gentle slope which terminates at the upper edge in a steep rock-covered slope and in some places in a rock ledge. In parts of the county, too, this weathering of alternating hard and soft beds has given a mesalike appearance to the topography. This is rather marked southeast of Platte City, near New Market, and in many other places in the county.

The limestones vary in color from light yellowish brown to light gray, are very fossiliferous, and the greater proportion of them are thin bedded and shaly. Several harder, more crystalline and more

massive beds, however, occur. These vary in thickness from 8 to 24 inches, and the rock is used extensively for building purposes, for which it is well suited. Owing to its greater toughness it is not so well suited, however, for the manufacture of crushed rock as the lower-lying Bethany Falls limestone, which outcrops in the counties south of the Missouri River. The shale beds vary in color from yellowish gray, drab, and various shades of reddish brown to black. In hardness they vary from rock that can easily be crumbled between the fingers to rock approximating slate. The lighter colored beds usually contain considerable quantities of very fine mica particles and not infrequently thin strata of very fine textured sandy shale.

The soils derived from the limestone and shale beds have been so thoroughly mingled during the processes of soil formation that it is impossible to separate them on the basis of origin, and they have been classified as Crawford soils derived from alternating beds of limestone and shale.

At Waldron and in several places along the bluff between that point and Parkville large blocks of soft, yellowish-brown or buff colored, fine-grained sandstone are seen. The sandstone bed from which these fragments come also outcrops along Sand Branch, Brush Creek, Rush Creek, and other streams in the southern part of the county. If it extends farther north it is so low and so thoroughly covered by the more recent formations that it plays but a small part in the formation of the soils. This bed varies in thickness from 5 or 6 feet to more than twice that thickness, the thickest outcrop being noted about $1\frac{1}{2}$ miles northeast of Tiffany Springs, where it attains a thickness of about 15 feet. In some places the upper portion of this bed or one lying immediately above it is dark reddish brown in color and thin-bedded and shaly in character. Owing to its massive structure this sandstone, although very soft, does not weather rapidly. In parts of the area where it comes near the surface on long slopes it has furnished the principal soil-forming material, giving a smooth yellowish fine sandy loam of low fertility which has been called the Boone fine sandy loam.

Scattered over the surface and embedded in the soils in many places in Platte County there are large irregular masses of rock unlike any found in place in the bluffs or rocky ledges. A large part of these are reddish granite and quartzite, but many other rocks of foreign origin are represented. There are also in places, usually around the heads of the smaller streams, beds of waterworn gravel and pebbles. These also contain much foreign material, usually quartz, quartzite, and granite, but also limestone, chert, and other material probably of local origin. These beds of gravel-filled soil almost invariably occur immediately above a bed of limestone or

sandstone. The origin of this foreign material or drift is believed to have been ice sheets, which formerly spread from the north over the central part of the United States as far south as the Missouri River. Deposited with the waterworn material there is in many places a bright red clay in which the gravel is embedded. In places this red clay occupies the same position just above the rock beds, but contains little or no gravel, and in a few other places, especially in the eastern part of the county, a stiff, mottled puttylike clay not unlike the glacial till found under the flat prairies in the central part of the State is found. All of this material is believed to be the result of an early glaciation, known as the Kansan. The soil derived from this old glacial material has been called the Shelby loam. It is of small extent and not of great value agriculturally.

Overlying the material giving rise to the Shelby series and in most places covering it to a considerable depth are soils of a very different character, known as the loess soils. These soils range from light yellowish brown to brown or almost black in color, are smooth and velvety to the touch, and of almost uniform texture, both in the vertical section and over large areas. Where cut into by streams or roads they stand up in vertical banks, resisting erosion to a remarkable degree; but where gullies are allowed to start they erode very rapidly, soon leaving deep V-shaped gashes. The depth of the loess in Platte County varies from only a few inches to 60 or 80 feet or more. Taking the area as a whole, the deepest loess occurs on top of the bluffs bordering the Missouri River Valley and thins out toward the east and north, or away from the river. On the bluffs near Weston the loess is undoubtedly in places 60 feet or more deep. In the cut of the Chicago, Rock Island & Pacific Railroad, $3\frac{1}{2}$ miles west of Platte City, a bank of soil between 50 and 60 feet deep is exposed, the upper 30 feet being loess, while the lower part of the section is redder in color and seems to be somewhat heavier in texture. Erosion, however, has had much to do with the present thickness of the loess for it has been washed from the slopes and has partly filled the valleys. In some places it has been entirely removed, but there are few soils in the area which have not been influenced by it. It is this deposit over a large part of the county which gives the topography its billowy, rounded appearance.

No very satisfactory explanation of the origin of loess has ever been given, but from its uniformity of material, its lack of stratification, and its deposition in beds of fairly uniform thickness regardless of topography it has generally been attributed mainly to the action of the wind.

From the uniform tendency of the deposits of loess material to be thickest along the river bluffs and to thin out away from them, it seems more than probable that broad river flood plains, such as that

of the Missouri, may have had an important part to play in loess formation and deposition. Such flood plains were no doubt inundated many times during the recession of the ice sheet, each inundation leaving its load of finely ground material fresh from the melting ice. As these vast stretches dried after each period of inundation the strong winds which must have accompanied such conditions loosened the particles and carried them in storms of loess over the bluffs, dropping the very fine sand at the first obstructions, but carrying the finer silt and clay farther inward. Only on a comparatively level surface such as flood plain are sand and dust storms likely to occur. Then, too, an analysis of loessial material invariably shows that near the bluffs it is coarser in texture, being sometimes a very fine or fine sandy loam, while farther from the bluffs it contains a higher percentage of silt and clay.

Whatever its origin, the loess has supplied one of the most productive soils in the United States. In Platte County it is by far the most important, covering a much larger area than all other soils combined. The loess soils have been divided into two classes—the brown and black loess called the Marshall silt loam, and the lighter colored yellowish loess called the Knox silt loam.

The alluvial soils of the area come from two principal sources. The first is wash from the loess mixed to a very small extent with wash from the residual soils and deposited in the flood plains of all the smaller streams. Soils formed from this material belong to the Wabash series. When the alluvial soils come so directly from the loess as they do in this area they often differ from the upland loess but little in color, texture, or crop value. In places, however, the sandier material has been sorted out and deposited, usually near the stream channel, while in other places the clays and silt have been deposited, thus forming heavy soils which have often become more intractable and apparently heavier on account of lack of drainage.

Alluvial soils of the second class are found in the flood plain of the Missouri River and have been formed from material brought down and deposited by that stream. Like the Wabash soils, they vary in texture from very light fine sand to heavy clay. Their principal distinguishing characteristic is the sandy or light silty character of the subsoil underlying the heavier surface soils. These soils belong to the Sarpy series. Near the bluffs bordering the Missouri River flood plain, and especially where small streams enter it, considerable areas are covered by soils which are a mixture of the Wabash and Sarpy series. The Wabash characteristics usually predominate at the surface near the stream channel, while the Sarpy characteristics are found in the subsoil. Farther from the streams the two materials are more thoroughly mixed.

The following table gives the name and extent of each soil mapped in area:

Areas of different soils.

Soils.	Acres.	Per cent.	Soils.	Acres.	Per cent.
Marshall silt loam.....	86,016	31.5	Shelby loam.....	9,664	3.5
Knox silt loam.....	65,216	23.9	Wabash very fine sandy loam..	8,384	3.1
Crawford stony clay loam.....	36,544	13.4	Sarpy very fine sand.....	4,544	1.7
Wabash silt loam.....	2,816	Boone fine sandy loam.....	3,456	1.3
Heavy phase.....	2,048	6.6	Sarpy loam.....	1,280	.5
Colluvial phase.....	768		Wabash clay.....	1,152	.4
Sarpy clay.....	16,000	5.8	Total.....	273,280
Sarpy very fine sandy loam...	12,992	4.7			
Sarpy silty clay loam.....	9,856	3.6			

MARSHALL SILT LOAM.

The Marshall silt loam is the most important soil type in Platte County, not only on account of its extent, but also of its high agricultural value. There are two distinct phases of the Marshall silt loam—the black or prairie phase and the brown or timbered phase.

The prairie phase consists of a dark-gray, black, or bluish-black silt loam, very fine and light, and containing considerable amounts of very fine sand near the surface. Beneath the surface 3 or 4 inches it becomes slightly heavier in texture and at 16 to 20 inches faint brown mottlings are occasionally seen. At a depth of 16 to 20 inches a few small iron concretions frequently occur and in a few instances lime concretions were encountered, usually below the zone of the iron concretions. Below 20 inches the color becomes somewhat lighter and at a depth of 24 to 28 inches mottlings of yellowish brown and gray appear and the type becomes heavier in texture, continuing to a depth of 40 inches. Although the upper portion of this subsoil has some of the characteristics of the "hardpan" found under the flat prairies of central Missouri, it differs from it in being lighter in texture and less impervious to water. The greater portion of this soil was originally prairie.

The brown phase of the Marshall silt loam was originally timbered and is known locally as "black walnut land." Typically it consists of a yellowish-brown, brown, or dark-brown silt loam, light, friable, and easy to cultivate and of even texture throughout the soil section, except that it becomes very slightly heavier with increased depth. At 16 to 18 inches the soil becomes distinctly lighter in color, changing to a yellowish brown, usually without mottlings, continuing to a depth of 40 inches or more with little change in color or texture, except that the lower 10 or 12 inches of the section frequently grades somewhat lighter in texture. When exposed along cuts and ditch

banks the lower portions of the soil section, immediately above the subsoil, cracks and checks in a characteristic way, somewhat like the "gumbo" land, except that the fragments are usually smaller.

The Marshall silt loam occupies a broad broken strip extending almost entirely across the eastern side of the county, several smaller areas along the northern side, the crest of the divide between Platte River and Bee Creek, and also the divides between Bee Creek and several smaller streams which flow to the west. Other small isolated patches are found throughout the county, except in the stream flood plains.

The largest continuous area of the prairie phase of the Marshall silt loam is located in the south-central part of the county and forms the divide between the streams flowing north and west into Platte River and Smith Fork and those which flow south into the Missouri River. On this phase are located Hampton, Hoover, and Linkville. Another important area extends from Ridgeley to the northeast corner of the county.

The characteristic timber growth on the brown phase of this type is black walnut, white oak, hackberry, white elm, honey locust, ash, and wild cherry. In places hard maple and pawpaw are found. Areas of this soil occur on the crests of the divides between drainage systems and on the long slopes which border many of the stream courses on one side. On the ridges the soil is usually surrounded by the lighter colored Knox silt loam, but on the long slopes bordering the streams it often occurs below the residual soil, which is found on the steep upper portion of the slope, and above the alluvial soil along the stream.

No definite line of demarcation can be drawn between the two phases of the Marshall silt loam as found in this area each grading into the other almost imperceptibly. In crop value there is little difference, the darker colored soil being perhaps somewhat better suited to corn, oats, and pasture grasses, while the brown phase is better suited to wheat, clover, alfalfa, and vegetables. The black phase also probably does not stand drought quite so well as the brown phase, but it occurs in larger, continuous areas, is less cut up by drainage ways, and more easily farmed.

The average yield of corn on the Marshall silt loam for a period of several years will probably average over 40 bushels per acre, and a much larger average yield can undoubtedly be obtained with better farming methods. Wheat yields from 20 to 25 bushels, while much larger yields have been reported. Oats are raised to some extent, and yields of 30 to 40 bushels obtained. Some tobacco has been grown on the brown phase of this type, but the yields have been less and the quality inferior to that grown on the Knox silt loam.

KNOX SILT LOAM.

The Knox silt loam consists of a light yellowish brown or buff-colored very fine sandy loam or light silt loam, friable, and velvety to the touch, and of almost uniform color and texture throughout the soil proper. In places at a depth of 16 to 18 inches this soil is somewhat heavier in texture than the surface soil or than the deep subsoil. The lightest soil occurs near the bluffs, where the loess deposit is very deep, becoming heavier as the deposit becomes thinner. Iron pipes and thin bands slightly cemented with iron oxide also occur at depths of 3 to 5 feet. Near Waldron large lime concretions were noticed in the loess banks at depths of 20 feet.

The principal body of the type extends in a broad, almost continuous belt nearly across the county from northwest to southeast. The southwestern boundary of this belt is sharply defined and bordered by the residual soils along the river bluff. The northeastern edge is uneven and irregular in outline, with many projections and extensions along the stream courses. Numerous isolated areas bordering the stream courses are found throughout the county. Near the river bluffs the Knox soils cover the entire surface, ridges and valleys alike. Back from the bluffs the type occupies the slopes and lower ridges only. In places the Knox silt loam and the brown phase of the Marshall silt loam are very closely related, the latter occupying the almost level areas and the concave slopes, while the former occupies the more eroded areas and the convex slopes. From this it would seem that the principal difference between these two soils is one of drainage and percolation of ground water, tending in the case of the Marshall silt loam to hold and collect organic matter while in the other case to distribute it.

The term "sugar-tree land" is applied locally to the Knox silt loam. Its timber growth consists principally of hard or sugar maple, black walnut, white oak, elm, linden, ash, and others. Clumps of pawpaw bushes are of frequent occurrence wherever this soil is found.

The type is well adapted to corn, wheat, clover, alfalfa, and especially to garden truck and fruit. It is the principal tobacco soil of the county. The yields for corn, wheat, and oats are approximately the same as those of the Marshall silt loam. Tobacco averages about 1,800 pounds per acre, alfalfa three to four cuttings of from one-half to 1 ton per cutting.

Although this is a very productive soil and suited to a wide range of crops, owing to its undulating topography, it is less desirable for general farming purposes than the more nearly level Marshall silt loam.

SHELBY LOAM.

The Shelby loam, to an average depth of 8 to 12 inches, consists of a reddish-yellow sandy to silty loam, usually containing waterworn

gravel and pebbles, and grading into a stiff red sandy clay in which numerous small waterworn rock fragments are embedded. This subsoil continues to a depth of 3 feet or more, but frequently the rock material becomes too heavy below 20 inches for the penetration of the soil auger. In places the surface soil to a depth of 15 or 20 inches differs but little from the Marshall silt loam or the Knox silt loam, but has the heavier gravelly subsoil. In the vicinity of Edgerton, in the northeastern part of the county, a considerable area of soil having a higher percentage of sand than is usually found in the Marshall silt loam has been included with this type, although in crop value it approaches more nearly the Marshall soils.

The type is an unimportant one derived principally from glacial drift, but mixed to a considerable extent with both the loess soils, which were originally deposited over it, and with soils derived from the limestone, shale, and sandstone on which it has been deposited.

A thin bed of drift consisting of foreign boulders, waterworn pebbles, gravel, sand of all grades, and red clay probably extends over the greater part of Platte County. In most places it is covered by deep beds of loess. Where it has been exposed by erosion around the heads of the small streams and along the steep slopes it is often so thin that the soils derived from it can not be shown on the soil map and have been included with the residual soils. In places, however, these are of sufficient extent to be shown on the map and have been called the Shelby loam, although the soil varies from a light loam to a red gravelly clay. Where exposed in fields or along the roadside the type is easily recognized by its yellowish-red or reddish-brown color, by the numerous rock fragments embedded in the soil, and by its location immediately above rock outcrops.

The timber growth on the Shelby loam differs markedly from that of the loess soils and consists largely of hickory, black and red oak, with an occasional scrubby white oak or post oak.

Owing to the great variations in this soil and to its small irregular areas, no very accurate estimate of crop yields can be given. As a whole it is of rather low agricultural value, the average yield for corn probably being 25 bushels per acre and of wheat 12 or 15 bushels.

CRAWFORD STONY CLAY LOAM.

The Crawford stony clay loam is variable in texture, ranging from a sandy loam through a silt loam to a silty clay. It usually, however, consists of a yellowish-brown silty clay varying in depth from 3 to 10 inches and grading into a darker yellowish brown, tenacious clay, which extends to a depth of 3 feet or more and is sometimes underlain at a lesser depth by beds of limestone or yellowish drab shale. Over a considerable portion of the area thin fragments of fossiliferous limestone are scattered over the surface and through the soil

profile. This soil has been greatly modified by the deposition of thin layers of loess over its surface. In places the Knox silt loam occupies the top of narrow ridges while the Crawford material is found on the eroded slopes. Where fields having a thin loess covering are cultivated the darker and heavier Crawford material often shows at the surface as darker brown spots, giving the field a mottled appearance. In other places small areas of Shelby loam have been included with this type.

The Crawford stony clay loam is a residual soil derived from the weathering in place of beds of limestone and shales of the Upper Coal Measures. It has the widest distribution of any soil in the county. A narrow strip of it extends along the edge of the bluffs bordering the Missouri River bottoms and other narrow strips follow the bluff lines bordering all the principal streams. In the southern part of the county it is the predominating upland soil, and patches of it occur wherever erosion to a sufficient degree to remove the surface covering of loess and till has taken place.

Wherever it occurs in the long, narrow strips which usually represent bluff lines or steep slopes, especially in the northern and central parts of the county, it is filled with fragments of limestone, and rock outcrops are common. In many places the soil is very shallow, resting upon the underlying rocks at depths varying from 1 to 3 feet. In these areas, owing to steep slope and excess of rock fragments, approximately one-half the soil is shallow and unfit for agricultural purposes. Farther south, where larger areas occur, not more than one-third or one-fourth is too rocky for cultivation. The rocky areas are usually timbered or covered with brush. Owing to the small size of the areas covered by the Crawford stony clay loam, no attempt has been made to separate the stony from the stone-free areas, but the principal stony areas have been indicated on the map by rock outcrop symbols.

Where cultivation is possible the Crawford stony clay loam produces fair crops of corn and small grains. Some tobacco is also grown on it. Corn will probably average 30 bushels and wheat 12 to 15 bushels. Bluegrass and white clover do well on it and the more stony portions are used almost exclusively for pasture.

BOONE FINE SANDY LOAM.

The Boone fine sandy loam consists of a smooth, friable grayish-yellow to reddish-brown fine sandy loam, varying in depth from only a few inches to as much as 20 or 30 inches, although in most places the depth is less than 20 inches. The subsoil is composed principally of yellow fine sand, the result of disintegration of sandstone. In places the surface soil is filled with small, thin fragments of reddish-brown shaly sandstone and contains waterworn gravel washed down from the drift which was deposited above it.

Sandstone outcrops occur along several of the smaller streams in the southern part of the county. The weathering of this material has given rise to a fine sandy loam soil of limited extent and of rather low agricultural value. The areas of this soil are small and usually widely separated, being confined to small patches around the heads of small streams which rise near the zone of outcropping sandstone, or to slopes which are in just the right position to catch the weathered material which creeps down from this formation.

Along the lower slopes of the areas covered by the Boone fine sandy loam, where accumulations of organic matter occur, it is darker in color and is fairly productive and well suited to melons, garden truck, and berries. Over the greater portion of the areas covered by it, however, it is of little value for the cultivated field crops or for meadow or pasture.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of this type:

Mechanical analyses of Boone fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
341803.....	Soil.....	0.3	0.7	0.4	17.9	44.7	27.8	8.0
341804.....	Subsoil.....	.4	.6	.4	26.3	43.3	20.3	8.6

WABASH VERY FINE SANDY LOAM.

The Wabash very fine sandy loam as found in Platte County is derived almost entirely from material eroded from the loessial upland soils and redeposited by flood waters. It differs from those soils principally in being lighter in texture and in containing a higher percentage of organic matter. In color it varies from dark brown, dark gray, and in a few places almost black to light yellowish gray or buff, closely resembling the Knox silt loam in color. The greater part of the type is composed of the lighter shades. In texture the soil varies from a very fine to fine light sandy loam. In some places, especially in those portions of the areas adjacent to the streams, the lower subsoil grades into a very light fine sandy loam or fine sand.

In the valley of the Platte River small bodies of medium sand or very light sandy loam are encountered which, on account of their small size, have not been shown on the soil map, but have been included with the surrounding soil, which is usually fine sandy loam or silt loam. These areas of lighter soil occur as low ridges, and on account of their high content of sand are rather unproductive.

The Wabash very fine sandy loam is one of the most easily cultivated, productive and widely distributed soil types of the area. The

principal objectionable features to its development are that it usually occurs in long, narrow strips, often crossed and recrossed by the stream along which it occurs, and that in many places it is subject to overflow.

The largest continuous body of this type occurs along Bee Creek, where a strip averaging about one-fourth of a mile in width extends from the point where this stream enters the county near Dearborn almost to Beverly Station. Numerous smaller interrupted areas occur in the valley of the Platte River, while still smaller bodies of it lie along the valleys of practically all the smaller streams in the county. Many of these small areas on account of their size have been included with the adjacent types. Where the Wabash very fine sandy loam occurs in the valley of a large stream it usually occupies a position near the stream course. In many places it occupies a lower and more frequently overflowed flood plain, being separated from the heavier soils by a steep terrace 6 to 12 feet in height. In places along Bee Creek the lower level is occupied by a very light fine sandy loam, while the upper level is occupied by a fine sandy loam somewhat heavier in texture. In the smaller stream courses the fine sandy loam usually occupies the entire flood plain.

This soil gives good yields of corn, wheat, clover, and alfalfa. It is especially suited to vegetables, melons, and small fruits.

WABASH SILT LOAM.

The Wabash silt loam where typically developed consists of a gray, dark-gray or grayish-brown to almost black silt loam, light and friable at the surface and containing an appreciable amount of fine sand. It becomes slightly heavier with depth, grading at 16 inches into a heavy dark-colored silt loam, which continues to a depth of 3 feet or more, the lower part of the section being occasionally slightly mottled with spots of reddish brown. In some parts of the area, especially in the valley of Bee Creek, the lower portion of the subsoil becomes lighter instead of heavier, grading in places into a fine sandy loam.

Wabash silt loam, heavy phase.—A heavy phase of the Wabash silt loam occurs in several places in the Platte River Valley, in which the surface soil is nearly typical in texture, although usually darker colored and in places almost black in color. It is underlain at a depth of 12 to 18 inches by a heavy gray or mottled gray and brown tenacious silty clay. This phase is shown on the soil map by cross hatching.

Wabash silt loam, colluvial phase.—A few small areas of the colluvial phase of the Wabash silt loam have been mapped. These occur along the upper courses of a few small streams which head well out on the level uplands. The soil has come from the adjacent

areas through gradual movement down the slopes, but has not been carried in suspension and redeposited as true alluvial soils have been. It consists of dark-gray or black silt loam which becomes heavier with increased depth. Below 16 or 18 inches it is often a very heavy silt loam or clay loam. It is rich in organic matter and productive, but frequently needs artificial drainage.

The Wabash silt loam found in this area is derived from the same sources as the very fine sandy loam and consists almost entirely of washed loessial material. In the case of the silt loam, however, a larger proportion of silt and clay and less fine sand have been deposited.

The largest areas of this soil occur in the valleys of the Platte River and Smith Fork, but smaller areas are found in the valleys of several of the less important streams. In most places the type does not extend entirely across the valley, being separated from the stream channel by narrow strips of fine sandy loam, some of which are shown on the map. Along the edges of several of the smaller stream valleys benches or "high bottoms" occur. These lie at a considerable elevation above the present flood plain of the streams along which they occur and are separated from them by a distinct terrace slope. Where cut into by gullies these benches are seen to be made up almost entirely of loessial material, and in most places the soil closely resembles the Knox silt loam, although its position and level surface clearly indicate its alluvial origin. These benches have been mapped as Wabash silt loam.

The Wabash silt loam is well suited to corn and wheat, and where the subsoil is not too heavy and is well drained, clover and alfalfa can be grown. Much of the type is subject to overflow, and some areas can be greatly benefited by artificial drainage. Corn will average about 50 bushels per acre and wheat 25 bushels. Much larger yields are often obtained.

WABASH CLAY.

The Wabash clay consists of dark-gray, black or bluish-black, heavy, tenacious clay, differing but little in the subsoil in texture, the color showing somewhat lighter and being a pronounced gray where exposed along ditches and allowed to weather. The surface soil has a tendency to check and crack badly, the fissures often extending to a depth of 12 or 15 inches. All of this type needs artificial drainage.

Although this soil is heavy and difficult to handle nearly all of it is cultivated, and when the season is favorable good yields of corn and wheat are obtained. On account of its low position and impervious subsoil crops are liable to suffer from excessive moisture, and on account of its tendency to crack and check it does not withstand protracted seasons of drought.

SARPY VERY FINE SANDY LOAM.

The Sarpy very fine sandy loam consists of a light yellowish-brown, fine to very fine sandy loam of medium texture, extending to a depth of 15 to 36 inches or more. Where of less than 3 feet in depth it is usually underlain by a heavy silt loam, clay loam, or clay of darker color.

The Sarpy very fine sandy loam in Platt County is confined to the Missouri River flood plains where two distinct phases have been mapped—the outer valley phase and the river phase. The former occurs next to the bluff line, immediately in front of the point where each of the principal smaller streams enter the valley and for some distance along the tortuous channels of these streams as they cross the level flood plain. The principal areas occur along the lower course of Sugar, Bear, Brush, and Rush Creeks. Each of these streams in the upper portion of its course has a steep grade and in times of heavy rainfall a swift current, which carries down large amounts of sand and silt from the uplands. This material is dropped when the lower grade of the valley floor checks the velocity of the stream. In many places the streams have changed their course frequently to avoid previously deposited material.

The fine sandy and silty material is more or less mixed with the soils carried by the flood waters of the Missouri. In several places areas of clay have been covered by this lighter soil to depths varying from a few inches to 2 or 3 feet, which is deepest next to the stream channel and thins out and becomes more thoroughly mixed with the Missouri River soils away from the stream. On account of its location in the Missouri River flood plain and thorough mixing with the Missouri River soils it has been classified with the Sarpy rather than with the Wabash soils. Locally it is often referred to as "made land," and is one of the most productive soils of the area, being well suited to all the ordinary field crops and especially to garden crops and small fruits.

The river phase of the Sarpy very fine sandy loam occurs in long, narrow strips usually close to the river front and along the sloughs and lakes. It usually grades from a fine sand or very light fine sandy loam on the stream side to a heavier soil away from it. Small areas of sand and others of heavier soil are common. Thin layers of sand and of heavy soil are also frequently encountered in the soil profile. Typically it consists of a light yellowish-gray fine or very fine sandy loam underlain at a depth of 15 to 30 inches by a light-yellow fine sand. This phase of the Sarpy very fine sandy loam gives only fair yields of corn and grain. It is well suited to melons, vegetables, and small fruits.

SARPY SILTY CLAY LOAM.

The Sarpy silty clay loam consists of a dark-gray to a light yellowish brown fine sandy loam to silty clay, becoming heavier in texture at depths ranging from 6 to 16 inches, and underlain at 18 to 30 inches by a fine sandy loam, fine sand, or light silt loam. Alternate layers of light and heavy soil are common throughout soil and subsoil. The surface soil is usually light and friable and can be readily cultivated under proper moisture conditions. When handled too wet, it tends to puddle and upon drying becomes hard and cloddy.

Areas of this soil are distributed throughout the Missouri River flood plain.

The Sarpy silty clay loam gives good yields of corn, wheat, and clover. On account of its good underdrainage it is also well suited to alfalfa.

SARPY CLAY.

The Sarpy clay covers the widest area of any soil in the Missouri River bottoms. The surface of the Sarpy clay consists of a dark-gray to yellowish-brown or almost black silty clay, heavy and tenacious, and cracking badly when dry. At depths varying from 8 to 30 inches it is underlain by a fine sand, fine sandy loam, or light silt loam. In some places the light subsoil is not encountered, the lower subsoil being a slightly mottled silty clay.

This type usually occupies the lower portions of the flood plain. Much of it is not cultivated and is covered by dense growths of small willows and cottonwoods. This condition is due to its low-lying position and danger from overflow rather than to differences in soil. As a whole, the heavy surface soil on these willow flats is usually lighter and not so deep as on those areas which are cultivated.

The type is one of the most extensively developed soils of the area. It is a heavy, refractory soil and difficult to handle. Owing to its tendency to check and crack it does not stand drought well, but under favorable climatic conditions it gives fair yields of corn and wheat.

SARPY LOAM.

In the vicinity of Duck Lake and south of it a few areas of soil have been mapped as Sarpy loam. This type consists of Sarpy silty clay loam, which in places contains a rather high percentage of sharp medium sand, with low mounds and ridges of fine sand and fine sandy loam too small to be shown on the soil map scattered over its surface. The topography is rather uneven and the crop value slightly lower than that of the Sarpy silty clay loam.

SARPY VERY FINE SAND.

In several places long, narrow strips of very fine sand occur along the river front, and in many other places small areas too small to

map have been included with the surrounding soils. These areas consist of a fine or very fine, loose, fluffy sand, light yellow or light gray in color, and containing numerous small mica fragments. It seems to be made up of the same material found in the lighter-textured layers of the other Sarpy soils. It has a low agricultural value and little of it is cultivated except the small patches which are surrounded by heavier soils.

The following table gives the results of a mechanical analysis of a sample of soil of this type:

Mechanical analysis of Sarpy very fine sand.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
341828.....	Soil.....	0.2	0.2	0.1	6.3	46.3	40.0	7.2

The following sample contained more than one-half of 1 per cent calcium carbonate (CaCO_3): No. 241828, 5.04 per cent.

SUMMARY.

Platte County is situated in the northwestern part of Missouri and has an area of 427 square miles, or 273,280 acres. It consists of two main physiographic divisions, the almost level flood plains, or bottom lands, and the hilly and broken uplands.

The principal crops of the county are wheat, corn, and tobacco. The yields are good, but should be greatly increased through better methods of farming. The county leads the State in the manufacture of whisky and ranks second in the production of tobacco.

The excellent soils of the county and its proximity to good markets offer excellent opportunities for the establishment of profitable dairy farms and for the development of an important trucking industry.

Land values range from \$85 an acre for the broken and less productive lands to \$150 an acre for those which are more desirable and better improved.

The soils of the county, according to their source of origin, fall naturally into three distinct classifications, those formed from loess and glacial till, the alluvial soils, and the residual soils.

The soils formed from loess and glacial till occupy the greater part of the uplands. Although much of this region is hilly and badly dissected, the soils are naturally rich and productive and suited to a wide range of crops. Of these, corn, wheat, clover, alfalfa, bluegrass, fruits, and vegetables are the most important. The lighter-colored loess soils are the principal tobacco soils of the county.

The residual soils occur principally in the southern part of the county and in the rougher, more broken areas of other parts. They

are less productive than the loess soils and are in places too broken and too rocky for cultivation. Considerable areas are also covered by scrubby timber and underbrush. In some places, however, they have been greatly improved by a thin surface covering of loess.

The alluvial soils occur along the Missouri and Platte Rivers and the smaller streams of the area. Although portions of the alluvial soils are subject to overflow and artificial drainage is needed in places, they include some of the richest and most productive lands of the area. Some of them are well suited to corn, wheat, alfalfa, and clover. Other portions are especially well suited to potatoes, garden truck, and melons.

The greatest needs of the county are better farming methods, the adoption of a system of crop rotation in which one or more legume crops shall have a place, more thorough and persistent cultivation, the control of soil moisture, relieving the excess by drainage and conserving the rainfall, where needed, by cultivation, preventing loss from erosion, and building up the soil by raising and feeding more live stock.



[PUBLIC RESOLUTION—No. 9.]

JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture "

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided*, That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the Congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]

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SOIL
PROFILE
(3 feet deep)

Wabash
very fine sandy loam
Vfs
L
Wabash
silt loam
Sil
Hsil
Sil
Sic
Heavy phase
Sil
Sic
Colluvial phase

Wabash
clay
C

Sarpy
very fine sand
Vfs

Sarpy
very fine sandy loam
Vfs

Sarpy
loam
L

Sarpy
silty clay loam
Scil

Sarpy
clay
C

Marshall
silt loam
Sil

Knox
silt loam
Sil

Shelby
loam
L

Crawford
stony clay loam
Cl

Boone
fine sandy loam
Fsl

Boone
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LEGEND

Wabash
very fine sandy loam
Wv
Wabash
silt loam
W
W
Heavy phase
W
Colluvial phase
Wabash
clay
Wc
Sarpy
very fine sand
Ss
Sarpy
very fine sandy loam
Sf
Sarpy
loam
Slm
Sarpy
silty clay loam
Scl
Sarpy
clay
Sc
Marshall
silt loam
Ms
Knox
silt loam
K
Shelby
loam
Sl
Crawford
stony clay loam
Cc
Boone
fine sandy loam
Bl
Swampy areas
Rock outcrop

